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Editorial

Special Issue "11th EASN International Conference on Innovation in Aviation & Space to the Satisfaction of the European Citizens"

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This Special Issue contains selected papers from works presented at the 11th EASN International Conference on "Innovation in Aviation & Space to the Satisfaction of the European Citizens" (http://easnconference.eu/2021/home (accessed on 1 September 2022)), which was successfully held between the 1st and the 3rd of September 2021. Due to pandemic-related restrictions, this EASN Conference took place virtually. The event included 9 keynote lectures given by distinguished personalities of the European Aviation & Space Community and more than 370 technical presentations distributed in 69 virtual sessions. It is worth noting that in the frame of the conference, 85 Aviation and Space projects disseminated their latest research results as well as the future trends in their respective technological fields. In total, more than 420 remote participants from 31 countries worldwide joined the 11th EASN International Conference. These numbers make the 11th EASN Conference the second largest event in the series of the EASN Conferences.

From the numerous contributions to the 11th EASN Virtual Conference, a number of 19 papers, with more than 1000 views each up to now, were accepted for publication in the present Special Issue, following peer review.

In the work of Gelhausen et al. [1], the authors provided a first overview of the environmental benefits of Clean Sky 2 technologies, by employing DLR's forecast model. A substantial emissions reduction through the use of Clean Sky 2 innovations was highlighted. Under the umbrella of the Clean Sky 2 framework, De Martin et al. [2] developed a high-fidelity system model to support the design of an innovative iron bird developed in the frame of a Clean Sky 2 project and contribute to the definition of its control laws. The simulation results highlighted the stability of the proposed control scheme and provided a preliminary assessment of the system's performance.

On the engine side, De Giorgi et al. [3] presented an engine health monitoring system using artificial intelligence. The system was found to be capable of predicting the so-called performance parameters of some of the principal components constituting a turboshaft. In a second work focused on aircraft engines, Erario et al. [4], developed a numerical model of a micro gas turbine intended for the prediction and prognostics of engine performance. The results demonstrated the suitability of the model for predicting microturbine performance. Finally, in another engine-related work, Mehdi et al. [5] investigated the experimental and numerical characterization of flow dynamics and flame re-ignition in a rectangular burner of an aeroengine, particularly at high altitude conditions. To this end, a ring-needle type plasma actuator was considered and run by a high-voltage (HV) nanopulsed plasma generator.

There are two works on novel propulsion in this Issue. In the work of Seitz et al. [6], a fuel cell–gas turbine hybrid propulsion concept was introduced and assessed. The performed initial assessment demonstrated the potential of future solid oxide fuel cell technology synergistically combined with Gas Turbine engines for application in transport aircraft propulsion and power systems. Spinelli et al. [7] introduced a novel set-based design space exploration methodology in order to analyze the effects of different strategies on the fuel consumption, NO*x*, and take-off mass of a hybrid-electric aircraft. The proposed energy management strategies indicated reduction in fuel consumption and NO*x* emissions.

Two works focused on aircraft wings are included in the present Special Issue. In the first one, Castilla et al. [8] developed a methodology to estimate the structural mass breakdown of a wing while taking into account the effect of distributed electric propulsion. To achieve this, a semi-analytical methodology was adapted for use in the conceptual and preliminary design stages. In the second work, performed by Kafkas et al. [9], a multi-fidelity optimization framework for current state-of-the-art composite aircraft wings, based on the Mixed Integer Distributed Ant Colony Optimization (MIDACO), was presented. The proposed methodology demonstrated a successful blend of current state-of-the-art multi-fidelity structural, aerodynamic, and fluid–structure interaction analysis for structural optimization.

From the materials side, four works can be found in the present Special Issue. Valvez et al. [10] investigated the compression behavior of 3D-printed PETG composites reinforced with carbon or Kevlar fibers. The authors underlined that the addition of fibers to the polymers led to higher stress relaxations and compressive displacements. In another study focused on materials, Lahbacha et al. [11] investigated the electro-thermal properties of commercial films made by pressed graphene nano-platelets (GNPs), in view of their use as heating elements in innovative de-icing systems for aerospace applications. The first results showed that the targets requested for de-icing and anti-icing applications were met. The work of Norrefeldt et al. [12] investigated the effect of particle foam insulation and its installation procedure on the hygrothermal conditions behind the aircraft cabin sidewall. It was highlighted that careful installation of the particle foam frame insulation provided a similar level of moisture protection as the current state-of-the-art insulation. Finally, Kartsiropoulos et al. [13] presented a novel hybrid thermoplastic prepreg material enabling the fabrication of next-generation recyclable composite aerostructures produced by affordable, automated technologies. The results of the study showed that the developed hybrid thermoplastic material represents a viable manufacturing option from an industrial point of view and that its implementation in structural component manufacturing leads to clear cost and environmental advantages.

The work by Zajdel et al. [14] presents an airplane flight stabilization system, demonstrating its safety and efficiency during all ground phases of development. The presented stabilization system is expected to substantially increase the safety of general aviation airplanes performing the flights according to the free sky conditions. In [15], Welcer et al. assessed the impact of sensor errors on flight stability and underlined the importance of such information for the validation of the designed control system. In the work of Neumaier et al. [16], the authors proposed a method for an automatic pipe routing that automatically generates pipe designs with an integrated design optimization encoded in graph-based design languages and executable in a design compiler. The capabilities of their approach were demonstrated and compared to the series pipework in an Airbus A320 main landing gear bay. In [17], Todorov et al. propose the integration of fuzzy sets to model uncertainties during the evaluation of technological options by the experts at the conceptual design phase. The authors underlined that the suggested methodology can be defined as one of the integral stages necessary for the development of a much wider design method. Pérez-Castán et al. [18] developed a data-driven approach that predicts separation infringements between aircraft within airspace, by exploiting machine learning algorithms. The results showed that the said algorithms could perform conflict prediction with high-accuracy metrics. Finally, in the review paper of Kühnelt et al. [19], an overview of recent approaches for structural batteries was provided, assessing their multifunctional performance, and identifying gaps in technology development towards their introduction of commercial aeronautic applications.

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